New Interaction Techniques for Small Mobile Devices

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Thanks to the availability of powerful miniaturized electronic components, this last decade has seen the popularization of small mobile devices such as smartphones, and even smaller devices for wearable computing. These new devices have raised new interaction problems, such as the small size of the screen and the "fat-finger" problem (a relatively large portion of the screen is occluded and pointing lacks precision). The objective of the work reported here is twofold: 1) to acquire a better understanding of pointing on small devices, thanks to an advanced study of Fitts' law; 2) to design new interaction techniques for increasing the interaction bandwidth between the user and the device.

The WatchIt [1] Project: How to interact with Digital Jewelry?

Interaction problems

- Digital jewelry = jewelry + electronic components and sensors.
- Small tactile screen ➜ **finger occlusion & lack of precision**.
- Two kind of situations:
  - Not much **attention** is available
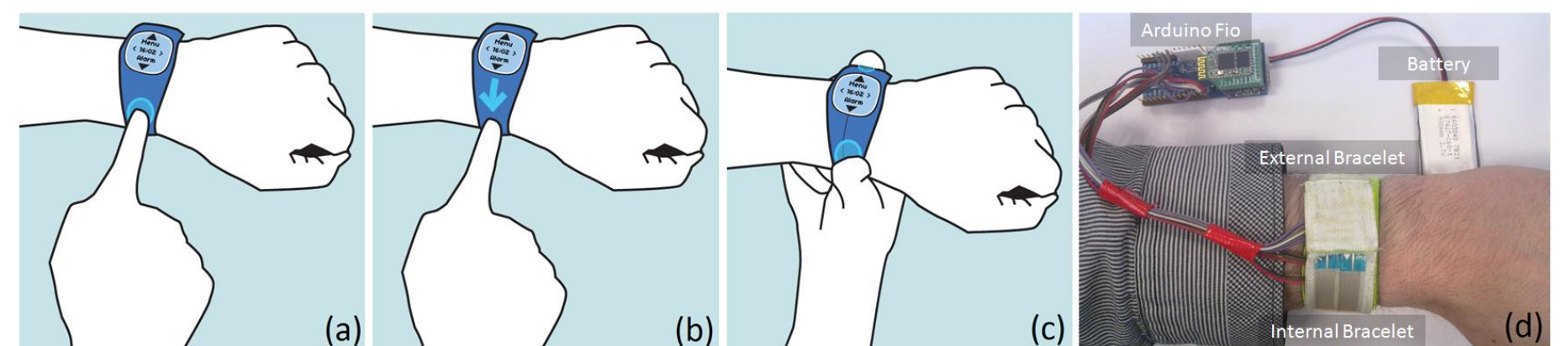 - **Precise** control is needed (selection of a particular song…)

Fig 1: WatchIt enables interacting with the wristband using gestures: (a) finger pointing, (b) finger sliding, (c) with two fingers on opposite straps, (d) the final experimental WatchIt prototype
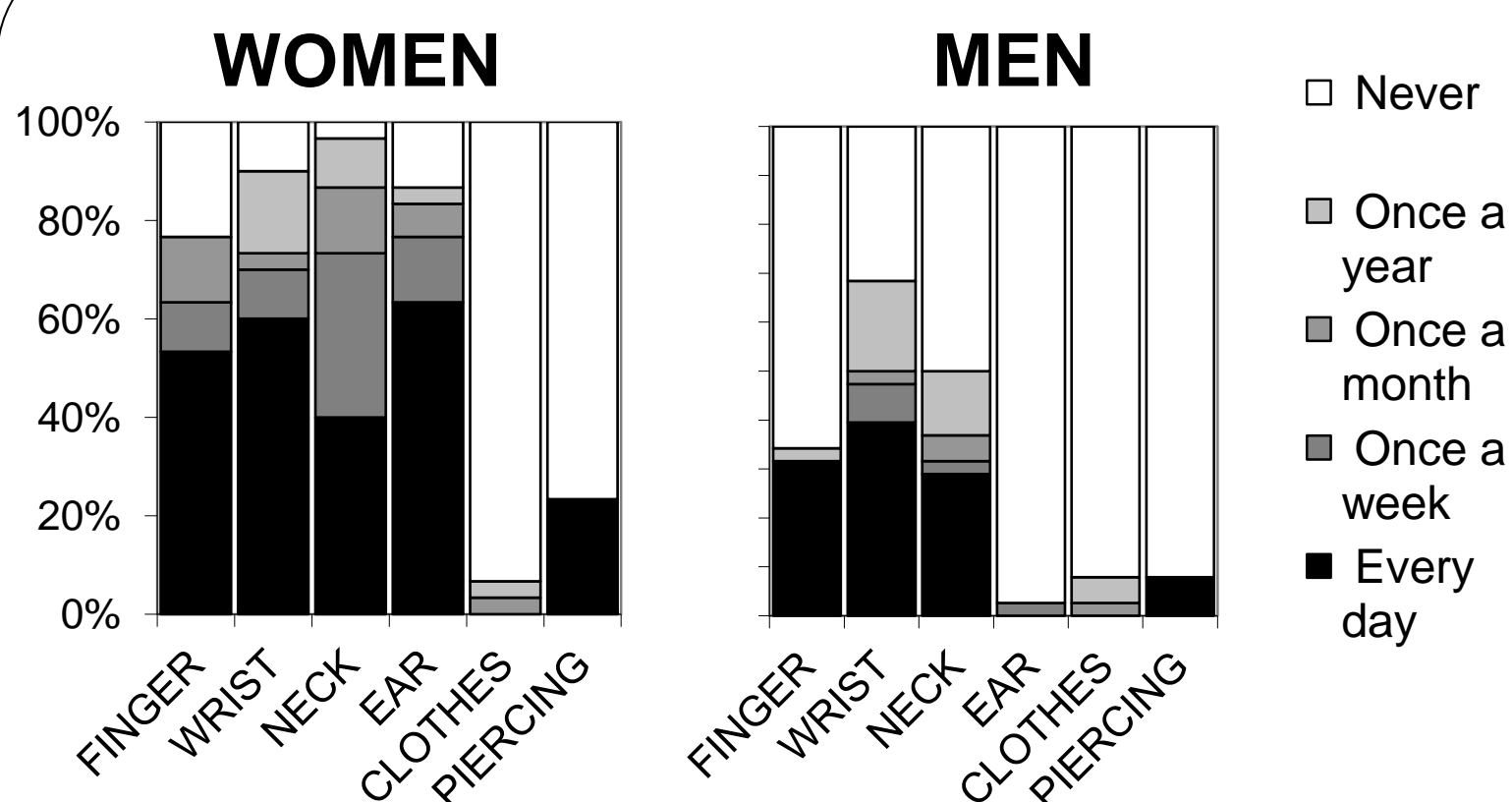
Step 1: Understanding people's expectations about Digital Jewelry

Fig 2: Frequency of traditional jewelry worn at various locations, for women and men

- Online poll to find out about 1) what kind of jewelry people wear ; 2) their interest in augmenting jewelry, and 3) the tasks they feel like to perform
  - **79%** wear 1+ piece of jewelry on a daily basis.
  - Preferred location: Wrist (**Figure 2**).
  - Tasks: music playing, SMS, GPS navigation, phoning and taking pictures/videos.
- We designed WatchIt, an interactive bracelet, and interaction techniques to use the device.

Step 2: Attention-free interaction

- Interaction techniques based on gestures (shortcuts, menu)
- Usable without looking at the device
- **Easy to perform (Figure 3)**
  - 91.25% success rate for shortcuts
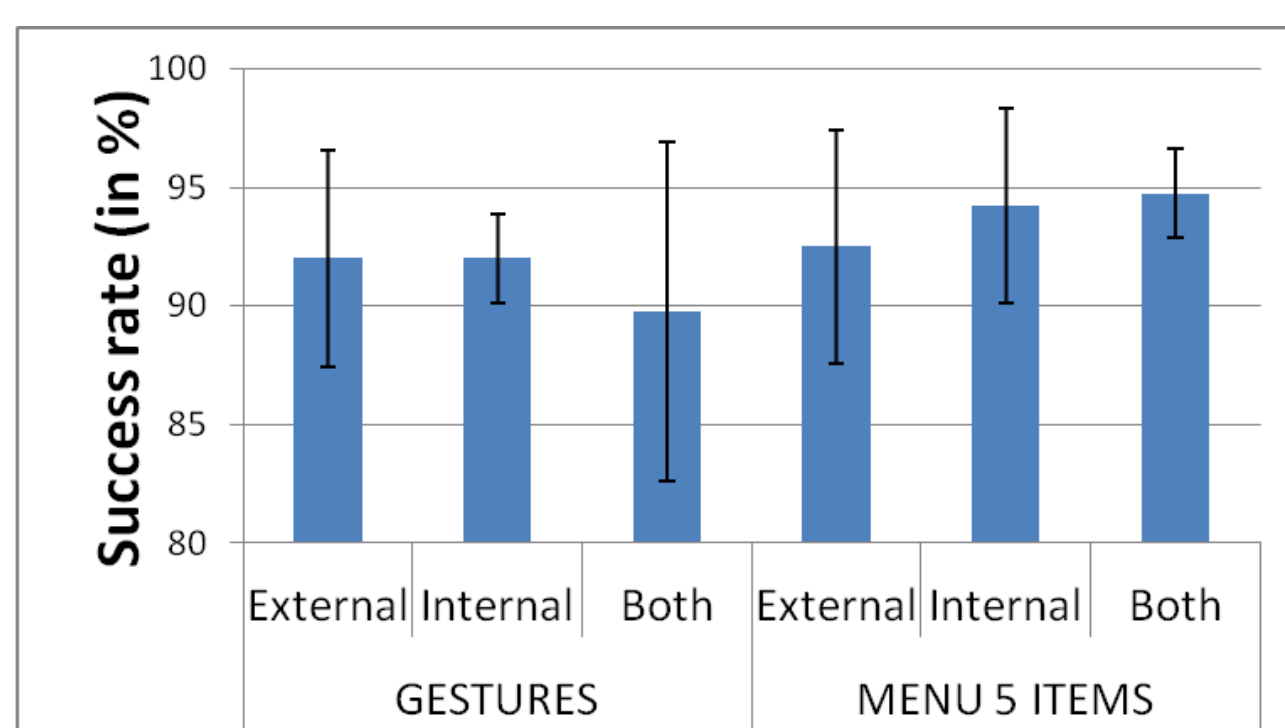 - 93.83% success rate for menu selection

Fig 3: Mean correct recognition rate for gesture and menu techniques.

Step 3: Precise and continuous interaction

- Navigation technique on the bracelet
- Compared to navigation on the tactile screen
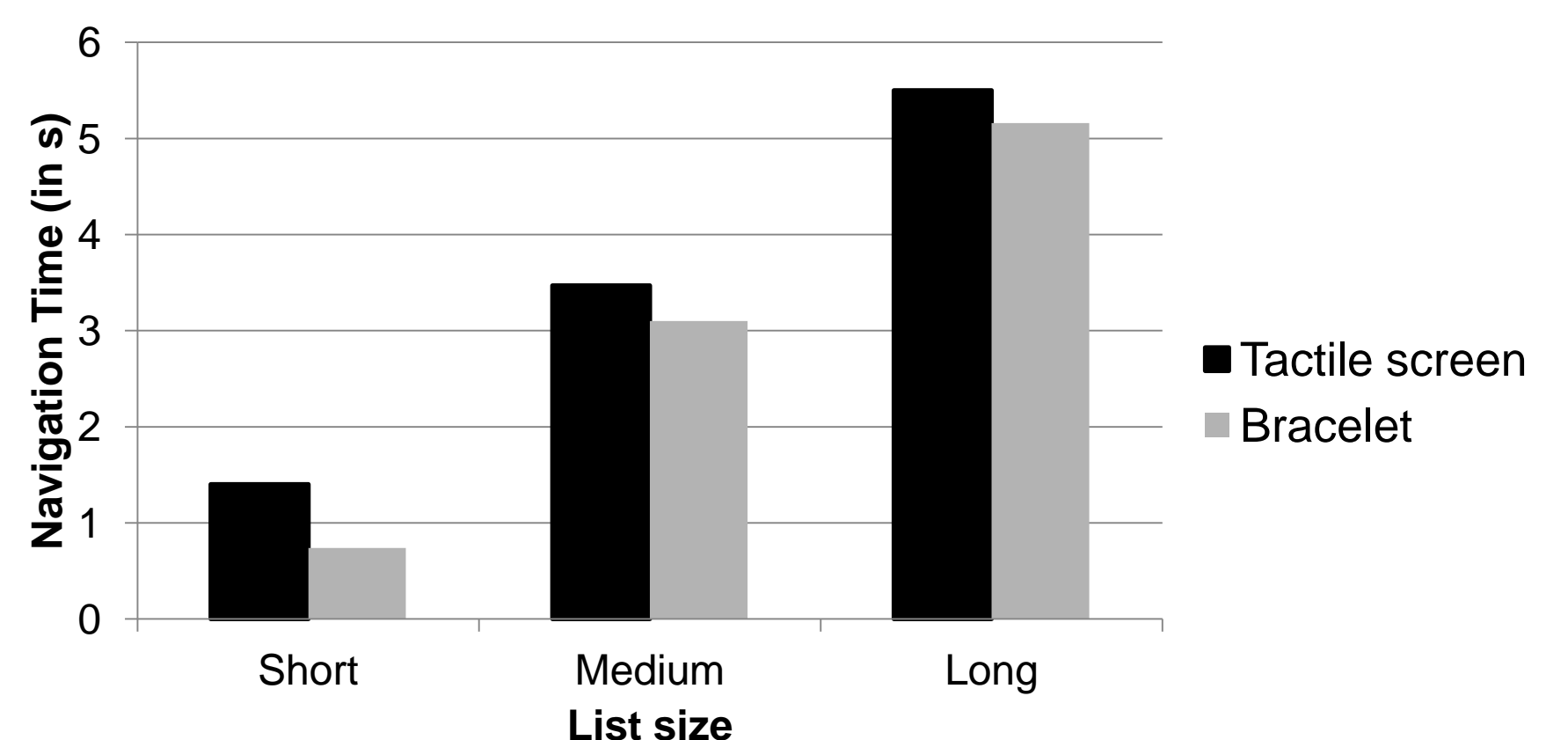- **Faster performance with bracelet than screen** (**Figure 4**)

Fig 4: Navigation time as a function of list size, for bracelet vs. screen interaction

1. Simon T. Perrault, Eric Lecolinet, James Eagan, Yves Guiard. 2013. WatchIt: Simple Gestures and Eyes-free Interaction for Wristwatches and Bracelets. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI'13). ACM, New York, NY, USA. 10 pages. To appear.

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